Change magnetic in alternating solenoid

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EP 0357102 A WO 88/05763 A US 4485012 A

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(54) Apparatus for treating fluids magnetically

(57) The apparatus comprises means to generate a first constant magnetic field and means to generate a second alternating magnetic field which is superimposed on the first, both means being adapted to be mounted in close proximity on a conveyance in a fluid system. In an embodiment, pole pieces 20, 24 of ferromagnetic material are mounted on a plastics pipe 8 together with magnetisation coils 18, 22. Coil 18 fed with DC while coil 22 is fed with AC. In other embodiments, the coils are longitudinally disposed on the pipe (Fig 4), or on ferromagnetic pole pieces (28, 32 Fig. 3) attached to the pipe; alternatively (Fig 5b) the pole pieces are omitted and the magnetising coils (42, 44) surrounded by an unconnected multi-turn coil (46) which acts as a pole. The field strength and frequency of the applied fields may be controlled (Fig. 1). The apparatus may be used with water to inhibit the formation of scale and with hydrocarbon fuels e.g. petrol, oil, diesel, to increase efficiency of fuel combustion.

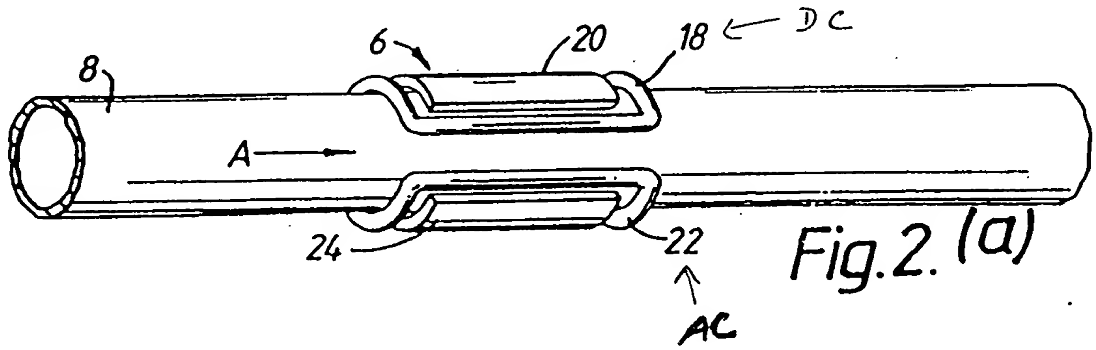

Fig.2.(a)

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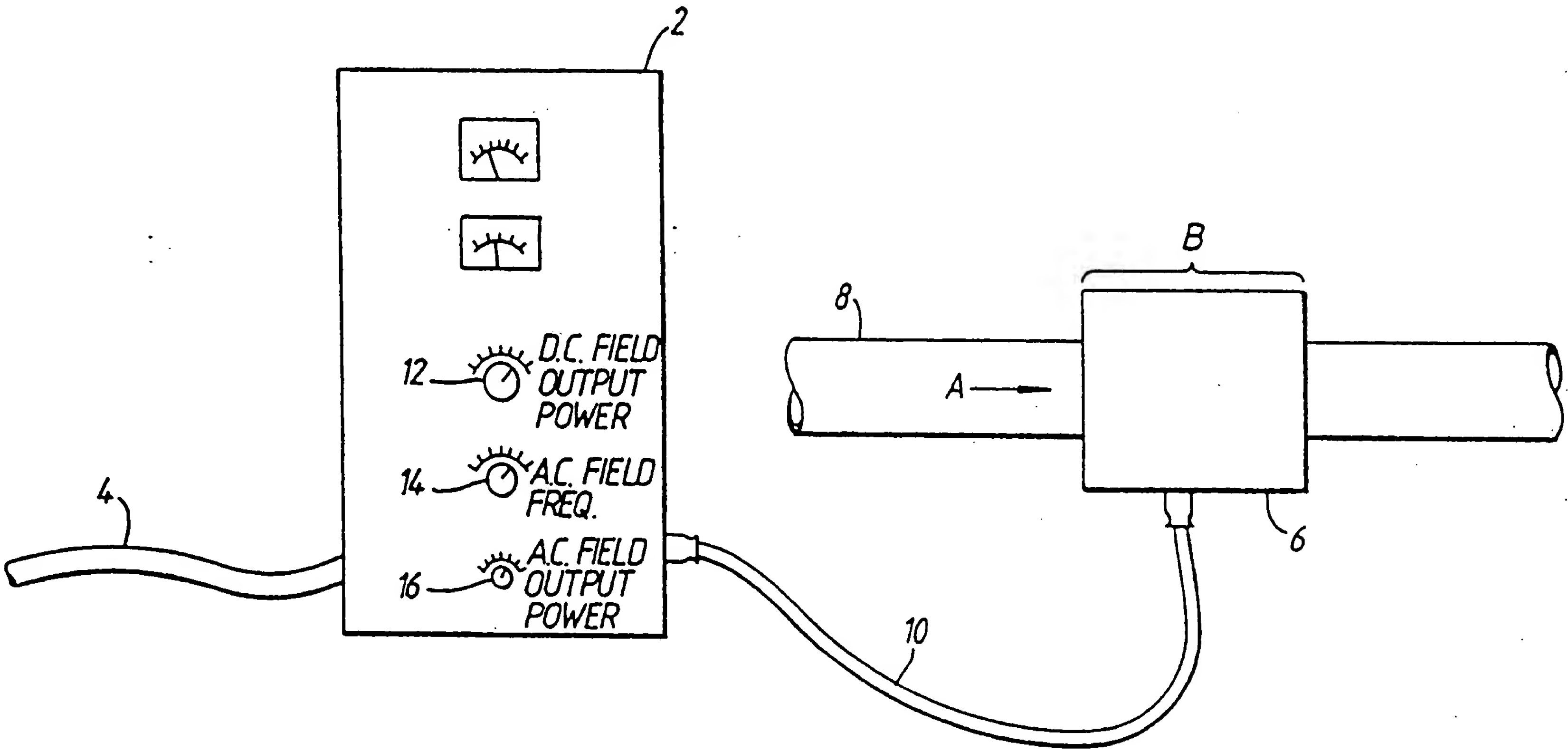
2
D.C. FIELD OUTPUT POWER
A.C. FIELD FREQ.
A.C. FIELD OUTPUT POWER
12
14
16
4
8
A
B
6
10

Fig.1.

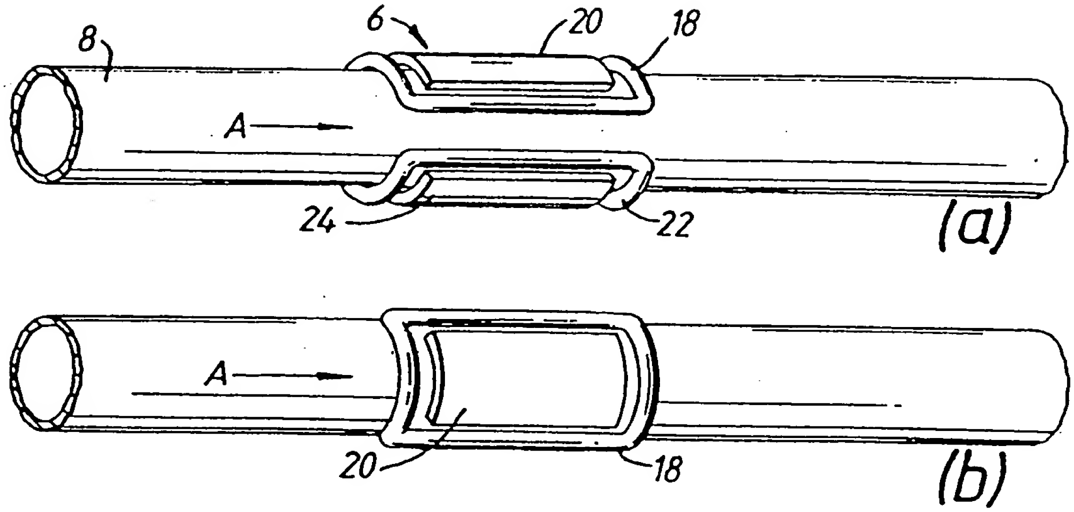

Fig.2.

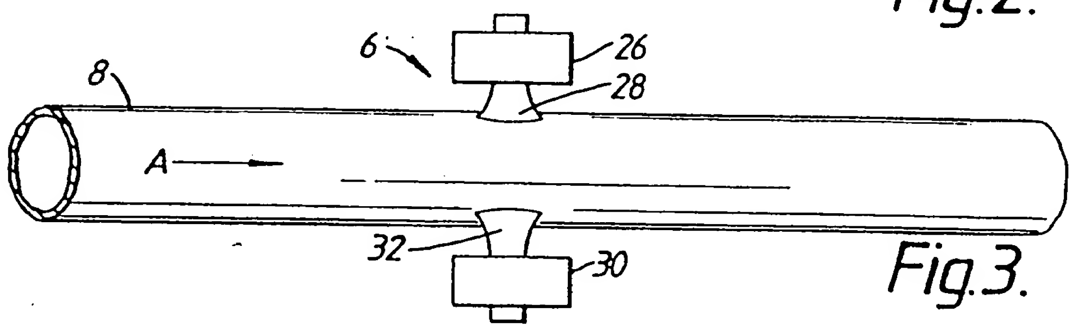

Fig.3.

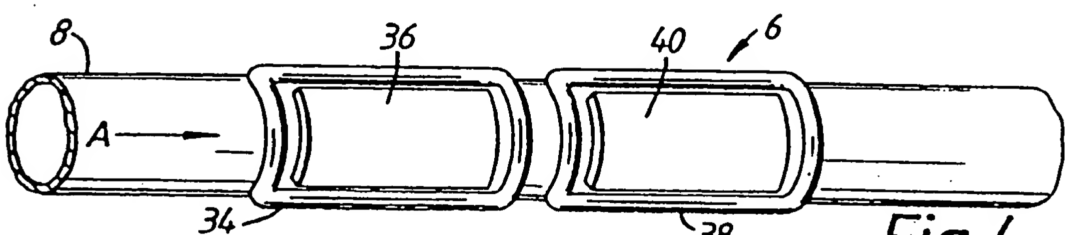

Fig.4.

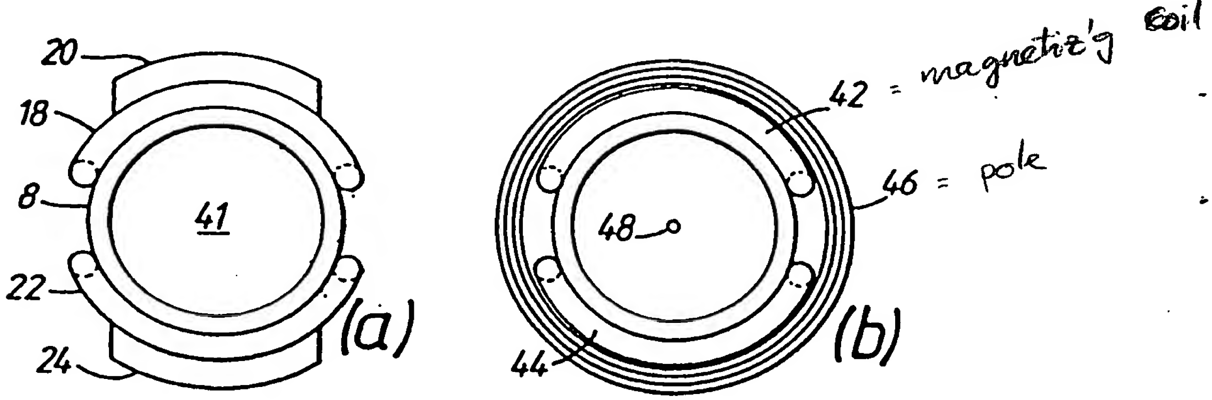

Fig.5.

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Fluid Treatment Apparatus

The invention relates to a fluid treatment apparatus and in particular to a magnetic fluid treatment apparatus in which the properties of a fluid and/or materials dissolved therein are altered by passing the fluid through a magnetic field.

It has long been recognized that when a magnetic field is applied to hard water it has the effects of: (1) increasing the solubility of salts of, for example, calcium, which may be deposited as scale: and (2) changing the structure of any deposits that do appear so that they remain soft and do not form the typical hard scale.

Existing devices which exploit this effect have employed permanent magnets and electromagnets to generate magnetic fields but the resultant effects have proved to be extremely variable: in some cases the amount of scale has been considerably reduced, whilst in others little effect has been observed. It is believed that the causes of this are the wide variations in water balance (ph, hardness, and the composition of materials present in the water).

A magnetic water treatment apparatus is disclosed in US Patent 4,485,012, in which a first coil, mounted on a pipe between a water source and a filter, produces an alternating magnetic field, generating mechanical vibrations in a pair of metal plates between which a flow of water passes and thereby causing mechanical perturbations in the water. A second coil, mounted on a pipe between the filter and pressure tank and remote from the first coil, is coupled to a d.c. signal which produces a constant magnetic field in the pipe through which the water passes in order to alter the solubility of salts in the water.

In the water treatment apparatus of the present invention a strong alternating magnetic field and a strong constant magnetic field, superimposed on the alternating field, are generated in the vicinity of the water being treated. This is because a constant field alone may not completely align the structure of the salts dissolved in the water and produce the desired effects of reducing scale deposits. On the other hand, the simultaneous use of the alternating field enhances the efficiency of the constant field by "freeing" the salts in solution so that they may more easily have their structures aligned by the constant field.

Desirable effects have also been exploited in the magnetic treatment of liquid fuels such as oil, diesel and petrol which undergo combustion in, for example, boilers and motor vehicle engines, and it has been found with existing apparatus that the efficiency with which such fuels are burnt may be increased when they are passed through a constant magnetic field.

However, it is believed that the full advantages of magnetic treatment of hydrocarbon fuels may not have been realised by such use of a constant magnetic field alone.

The present invention, in a similar manner to the water treatment apparatus mentioned above improves on existing magnetic fuel treatment devices by generating a strong alternating magnetic field and a strong constant magnetic field superimposed on the alternating field in the fuel being treated. Such treatment, which is applicable to both liquid and gaseous fuels, improves the fuel combustion efficiency on existing levels.

The present invention provides a fluid treatment apparatus, comprising: first magnetisation means for generating a constant magnetic field of pre-determined intensity, and adapted to be mounted on a conveyance in a fluid system; second magnetisation means for producing an alternating magnetic field of pre-determined frequency and adapted to be mounted in close proximity to the first magnetisation means.

The first and second magnetisation means preferably comprise one or more coils either in a single assembly or mounted separately around the periphery of a non-magnetic (e.g. plastic) pipe through which water is passed. Each magnetisation means may comprise a single coil, or a pair of coils mounted opposite each other around the circumference of the pipe.

The first and second magnetisation coils may be wound one on top of the other (layer wound) at the same point on a pipe, or may be mounted at longitudinally adjacent points on the pipe, in a manner similar to the arrangement of horizontal and vertical deflection coils of a cathode ray tube.

In order to concentrate the flux of the magnetic field within the fluid flow, magnetic pole pieces are preferably mounted on the pipe, within or adjacent the coil windings.

The coil assembly may include two coils connected in series and mounted (with respective pole pieces) opposite each other around the circumference of the pipe, effectively forming a single circuit driven by one source of power. Alternatively, each coil may be driven by a separate power source.

Power is supplied to the coils from a control unit which supplies a constant d.c. current to the first magnetisation coils, the current being adjustable to optimise the effect of realigning the structure of the salts dissolved in the water. The control unit also supplies an alternating current to the second magnetisation coils, and the magnitude and frequency of the alternating current may be adjusted, the latter from "mains" frequencies of 50-60H_Z up to 500RH_Z or more in order to obtain the greatest efficiency.

Embodiments of the present invention will now be described, by way of example only where the fluid is water (or an aqueous solution), with reference to the accompanying drawings, in which:

Figure 1 is a diagram of the general arrangement of the water treatment apparatus of the present invention in relation to a water-carrying pipe;

Figure 2 illustrates a coil assembly mounted on a water-carrying pipe in a first embodiment of the present invention, (a) as a side view, and (b) as a plan view;

Figure 3 shows a coil assembly mounted on a water-carrying pipe in a second embodiment of the present invention;

Figure 4 illustrates a coil assembly mounted on a water-carrying pipe in a third embodiment of the present invention;

Figure 5 shows alternative methods of increasing the flux within the water-carrying pipe in

the embodiments of the invention, (a) using a magnetic pole pieces, and (b) using an overwound coil along the periphery of the magnetisation coils.

A fluid treatment apparatus for the ease of fluids other than water (or aqueous solutions) has the same construction as the water treatment apparatus shown in, and described with reference to, Figures 1 to 5, save that the fluid flowing in the pipe 8 is a liquid or vapour such as oil, diesel or petrol, or a mixture containing such fuels.

The water treatment apparatus according to the present invention is illustrated in Figure 1. In this apparatus, a control unit 2 is supplied with power from the main's supply via a main's lead 4, and the control unit 2 in turn supplies power to a coil assembly 6, mounted around the periphery of a plastic water-carrying pipe 8, via a multi-conductor cable 10. The control unit 2 is provided with controls 12, 14, 16 for adjusting the d.c. output power to the constant-field coil(s), the frequency of the alternating field, and the a.c. output power to the alternating-field coil(s), respectively. The water flows in the pipe in the direction of the arrow A and comes under the influence of the magnetic fields when present in the region B.

In Figures 2(a) and (b), respectively, side and plan views of the coil assembly 6 of a first embodiment of the present invention are shown. The coil assembly 6 comprises a first multi-winding magnetisation coil 18 and associated pole piece 20 (made of a ferromagnetic material); and a second multi-winding magnetisation coil 22 and associated pole piece 24. Both the coils 18, 22 and the pole pieces 20, 24 are arcuate in cross-section so as to enable them to be snugly mounted on the outer wall of the pipe 8. The first coil 18 is supplied with a direct current from the

control unit 2 via the cable 10 and generates a constant magnetic field. The second coil 22 is supplied with an alternating current from the control unit 2 via the cable 10, and generates an alternating magnetic field.

Referring to Fig. 3, the coil assembly 6 of a second embodiment of the present invention is shown and comprises a first multi-turn magnetisation coil 26, wound about an axis perpendicular to the direction of elongation of the pipe 8, attached to a ferromagnetic pole piece 28 and mounted on the outer wall of the pipe 8. The coil assembly 6 also comprises a second multi-turn coil 30 (wound in the same manner as the coil 26) attached to a pole piece 32 and mounted diametrically opposite the coil 26 on the outer wall of the pipe 8. The first and second coils 26, 30 generate constant and alternating magnetic fields, respectively, as in the first embodiment described with reference to Fig. 2.

Figure 4 shows a coil assembly 6 of a third embodiment of the present invention which comprises two coils 34, 38 and two pole pieces 36, 40 which are identical to the coils 18, 22 and pole pieces 20, 24 of the first embodiment described with reference to Fig. 2. However, the first (34) and second (38) magnetisation coils are mounted immediately adjacent each other on the outer wall of the pipe 8, rather than diametrically opposite each other. The first and second coils 34, 38 generate constant and alternating magnetic fields, respectively, as in the first embodiment described with reference to Fig. 2.

Referring to Fig. 5, a cross-section through the pipe and coil assembly is shown in the first embodiment, and illustrates the arrangement of the coils 18, 22 and pole pieces 20, 24 which enables the magnetic flux density in the core 41 of the water carrying pipe 8 to be maximised. The coils and pole pieces are arranged

in a similar manner in the third embodiment.

An alternative arrangement for optimising flux density inside the pipe 8 is shown in Fig. 5(b), in which the first and second magnetisation coils 42, 44 and identical to the first and second coils 18, 22 of the first embodiment. However, the pole pieces 20, 24 are omitted and replaced by a multi-turn coil 46 which is wound around the outside of the coils 42, 44 about the axis of the pipe 8. The coil 46 is not supplied with any current, but rather forms a pole performing the same function as the pole pieces 20, 24.

CLAIMS:

1. A fluid treatment apparatus, comprising:

a first magnetisation means for generating a constant magnetic field of predetermined intensity, and adapted to be mounted on a conveyance in a fluid system;

a second magnetisation means for generating an alternating magnetic field of predetermined frequency and adapted to be mounted on the conveyance in close proximity to the first magnetising means;

wherein the alternating magnetic field is superimposed on the constant magnetic field within the conveyance.

2. An apparatus according to claim 1, wherein:

the first and second magnetisation means include one or more magnetisation coils mounted separately or in a single assembly around the periphery of the conveyance.

3. An apparatus according to claim 1 or 2 wherein:

each magnetisation means comprises a single magnetisation coil or a pair of diametrically opposed magnetisation coils, mounted around the periphery of the conveyance.

4. An apparatus according to claim 1, 2 or 3, wherein:

the magnetisation coils of the first and second magnetisation means are wound one on top of the other or disposed at longitudinally adjacent points on the conveyance.

5. An apparatus according to any of claims 1 to 4, wherein:

the first and second magnetisation means include magnetisation coils and one or more magnetic pole pieces mounted on the conveyance, the pole pieces(s) being disposed within or adjacent the magnetisation coils.

6. An apparatus according to any of the preceding claims, wherein:

said first or second magnetisation means includes two magnetisation coils connected in series and mounted diametrically apposite each other around the periphery of the conveyance, and

the magnetisation coils are connected to a single power source.

7. An apparatus according to any of claims 2 to 5, wherein:

the magnetisation coils are connected to separate power sources.

8. An apparatus according to any of the preceding claims, wherein:

the first magnetisation means includes means for varying the intensity of the constant magnetic field.

9. An apparatus according to any of the preceding claims, wherein:

the second magnetisation means includes means for varying the frequency of the alternating magnetic field.

10. An apparatus according to any of the preceding

claims, wherein:

the conveyance comprises a pipe formed of a non-metallic material.

11. An apparatus substantially as hereinbefore described with reference to Figs. 1 to 5 of the accompanying drawings.

- 11

Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search Report)	Application number 9121264.7
Relevant Technical fields (i) UK Cl (Edition K) B2J (JF, JN, JR) (ii) Int Cl (Edition 5) C02F (1/48) **Databases (see over)** (i) UK Patent Office (ii)	Search Examiner MR J L FREEMAN Date of Search 14 FEBRUARY 1992

Documents considered relevant following a search in respect of claims 1-11

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	EP 0357102 A (J P DE BAAT DOELMAN)	1
A	WO 88/05763 A (P NIESSEN)	1
A	US 4485012 A (E EHRESMANN)	1

SF2(p)

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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